

CHAPTER
25**Section 1****HISTORYMAKERS****James Watt**
Powering the World

"A New Invented Method of Lessening the Consumption of Steam and Fuel in Fire Engines."—title on the patent application for James Watt's first invention (1769)

For centuries, human and animal muscle pulled plows and wagons and operated oars. In addition, wind provided the power to run windmills and propel ships. However, these methods put limits on the amount of work that could be done. In 1705, the development of the steam engine broke through these barriers, and in 1765 a Scotsman named James Watt further spurred industrialization by vastly improving the steam engine.

Watt was born in Scotland in 1736. He was a sickly child, and his mother schooled him at home for a few years. However, the largest part of his education was in his father's workshop. He was a shipbuilder who also made devices for navigation. Young James was given his own tools, bench, and forge, and he learned how to build machines by making models of cranes and organs.

At age 18, Watt decided to become a maker of mathematical instruments. After some training, he moved to Glasgow to begin his work. Local guilds—organizations of craft workers—prevented him from starting his own business. Some friends, however, secured him an appointment at the University of Glasgow to practice his craft.

Before Watt was 30 years old, he had developed his first invention. He was asked to fix a steam engine used for demonstrations in a physics class. Steam engines had been in use for many decades in the mining industry, where they pumped water out of deep shafts. The problem was that these machines burned a tremendous amount of fuel to make steam. As Watt repaired the engine, he noticed this inefficiency.

The steam produced by the engine was pushed into a cylinder where the steam then cooled. The problem was that the cylinder had to be heated again because it cooled along with the steam. Watt invented a separate chamber where the steam could be condensed without reducing the temperature of the cylinder. As a result, his improved steam engines used considerably less fuel.

Watt then became partners with a business owner so he could manufacture his machine. Watt also filed a patent to own the rights to his creation.

Others could use it, but they had to pay a fee to Watt. In a few years his first partner was replaced by another, Matthew Boulton. Watt and Boulton worked together for several decades. They were a good team, with Watt providing the engineering knowledge and Boulton the business sense.

Watt continued to find new ways to make the steam engine work better. Then Boulton convinced Watt to devise one major improvement. Boulton believed that the steam engine could be used in mills that made flour and textiles. To be useful, though, the engine would have to drive machines that moved in a circle, not up and down like a pump. By 1781, Watt had built a motor that rotated a shaft that came out of the machine. As Boulton had predicted, the new invention caught on quickly. By 1800, his and Watt's company had sold about 500 steam engines in Great Britain, and most were the new rotating type.

Watt was also interested in chemistry and won credit for an important discovery. He was the first to suggest that water was not a basic element but a compound made of different chemicals. However, he was never able to identify what was involved in making water.

Watt was responsible for other inventions and held many different patents. They earned him around 76,000 British pounds in just over a decade. In 1800, when the patents expired, he and Boulton gave their business to their sons and retired. Watt lived 19 more years, spending the time traveling and receiving honors for his work. However, his interest in machines did not end. He had a workshop made in the attic of his house, where he continued to tinker.

Questions

1. **Drawing Conclusions** Why was the steam engine an improvement in powering work?
2. **Determining Main Ideas** What is a patent? Does the right it grants last forever?
3. **Making Inferences** How did Watt's and Boulton's different abilities strengthen their partnership?